GORGONIAN COUNTS
Henry Feddern

SPECIES	SQUARE-METER SETS																							TOTAL	AVERAGE.	% OF TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23			
A peak area for Brown Tree Gorgonian (Plexaurella sp.)																										
Inshore hard bottom, ca. 10 feet deep, .5 mile off Plantation Key, oceanside																										
purple willow	3				6	2	5		5	1	1	1	1	3	7	5	1	18	2	7	16	1	3	88	3.8	18.6
rusty			3		3	1	2	1	1	1		2	1	3				1	2	3	2		2	28	1.2	5.9
large-polyp	1	1		1		2		1		1	2	1	1			1					1	1		14	0.6	2.9
brown tree	5	1	4	4	5	5	4	5	3	1	8	2	3	3	3	7	4	3	9	6	1	5	7	98	4.3	20.7
others	11	10	12	9	6	10	15	7	14	6	7	5	12	22	14	15	9	11	15	4	13	6	11	244	10.6	51.6
TOTALS	20	12	19	14	20	20	26	14	23	10	18	11	18	31	24	28	14	33	28	20	33	13	23	472		
A peak area for Purple Willow gorgonian (Pseudopterogorgia sp.)																										
Inshore, smooth bottom, ca. 10 feet deep, .5 mile off Plantation Key, oceanside.																										
purple willow	15	6	15	18	17	15	23	24	32	26	18	12	21	23	11	23	37	17	16	27	28	20	25	469	20.4	
rusty		1	2															1						4	0.2	
purple tree				1	1	1	1	1	1					1	1	1	1	2	2	1		2		17	0.7	
others (not recorded, but essentially pure stand of purple willow)																										
TOTALS	15	7	17	19	18	16	24	25	33	26	18	12	21	24	12	24	38	20	18	28	28	22	25	490		
A peak area for Purple Bush gorgonian (Muriceopsis flavida)																										
Hawk channel, patch reef ca. 8 feet deep, 1.5 miles off Key Largo, oceanside.																										
purple bush	4	5	4	1	8	7	5	3	2	2	3													44	4	29.7
silver	2		2	3	2	2	4	2	3	2	2													24	2.2	16.2
plume		2								1														3	0.3	2
yellow ribbon								2																2	0.2	1.3
candalabra					1				1															2	0.2	1.3
brown tree	2	3	1	3	1	1	2		1	2	1													17	1.5	11.4
others	9	8	7	4	3	4	2	4	4	4	7													56	5.1	37.8
TOTALS	17	18	14	11	15	14	13	11	11	11	13	0	0	0	0	0	0	0	0	0	0	0	0	148		

Another peak area for Purple Bush gorgonian

Hawk Channel, another patch reef about 1 mile away from the first.

purple bush	6	8		4	5		5	5	1	3	3	2	2	9	1	4	2	2	5		2			69	3.3	15.8
silver	2	2	2	9	2	3	5	1	2	2	6	5	5	6	2	4	5	5	5		4			77	3.7	17.7
plume						1				1														2	0.1	0.4
yellow ribbon				3							3		2											8	0.4	1.8
candalabra																								0	0	
brown tree			3	1	4			2	1			2	3	2		3	2	2	2	4	1			32	1.5	7.3
others	7	5	7	17	14	12	7	18	12	15	17	9	10	9	15	10	12	9	17	14	12			248	11.8	56.9
TOTALS	15	15	12	34	25	16	17	26	16	21	29	18	22	26	18	21	21	18	29	18	19	0	0	436		

A peak area for Yellow Ribbon gorgonian (Pterogorgia citrina)

Hawk Channel, about 2 miles offshore, patchy seagrass and barely-emergent flat rock substrate

purple bush				1											1	1								3	0.1	0.8
silver										1		6		2	5	4			1				1	20	0.9	5.6
plume																								0	0	
yellow ribbon	3	5	3	5	7	4	2	5	3	2	8		8	2	1	1	8	4	6	9	5	4	6	101	4.4	28.1
candalabra																								0	0	
brown tree		2	1	6	5	5	4	7	2	8	6	3	6	2	1	6	5	7	4	2	10	6	4	102	4.4	28.3
others	13	4	6	3	7	8	5	7	2	7	5	12	8	5	6	2	10	8	3	5	5	1	2	134	5.8	37.2
TOTALS	16	11	10	15	19	17	11	19	7	18	19	21	22	11	14	14	23	19	14	16	20	11	13	360		

A peak area for Purple Frilly gorgonian (Pseudopterogorgia elizabethae)

Outer slope of reef, depths 40-100 feet, hardbottom.

purple frilly	6	2	5	7	4	1	5	4	3	1	3		6	4	4	7	5	1	3	10	4	1	13	99	4.3	19.1
purple tree	1		1																				2	4	0.2	0.7
sea stalk	1		1			4				2	2			1	1		6			1		6		25	1.1	4.8
others	13	15	9	12	9	10	14	27	17	7	30	21	19	12	10	11	21	24	19	27	16	20	27	390	17	75.3
TOTALS	21	17	16	19	13	15	19	31	20	10	35	21	25	17	15	18	32	25	22	38	20	27	42	518		

GORGONIAN COUNTS
Henry Feddern

SPECIES	SQUARE-METER SETS																							TOTAL	AVERAGE.	% OF TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23			
A peak area for Brown Tree Gorgonian (Plexaurella sp.)																										
Inshore hard bottom, ca. 10 feet deep, .5 mile off Plantation Key, oceanside																										
purple willow	3				6	2	5		5	1	1	1	1	3	7	5	1	18	2	7	16	1	3	88	3.8	18.6
rusty			3		3	1	2	1	1	1		2	1	3				1	2	3	2		2	28	1.2	5.9
large-polyp	1	1		1		2		1		1	2	1	1			1					1	1		14	0.6	2.9
brown tree	5	1	4	4	5	5	4	5	3	1	8	2	3	3	3	7	4	3	9	6	1	5	7	98	4.3	20.7
others	11	10	12	9	6	10	15	7	14	6	7	5	12	22	14	15	9	11	15	4	13	6	11	244	10.6	51.6
TOTALS	20	12	19	14	20	20	26	14	23	10	18	11	18	31	24	28	14	33	28	20	33	13	23	472		
A peak area for Purple Willow gorgonian (Pseudopterogorgia sp.)																										
Inshore, smooth bottom, ca. 10 feet deep, .5 mile off Plantation Key, oceanside.																										
purple willow	15	6	15	18	17	15	23	24	32	26	18	12	21	23	11	23	37	17	16	27	28	20	25	469	20.4	
rusty		1	2															1						4	0.2	
purple tree				1	1	1	1	1	1					1	1	1	1	2	2	1		2		17	0.7	
others (not recorded, but essentially pure stand of purple willow)																										
TOTALS	15	7	17	19	18	16	24	25	33	26	18	12	21	24	12	24	38	20	18	28	28	22	25	490		
A peak area for Purple Bush gorgonian (Muriceopsis flavida)																										
Hawk channel, patch reef ca. 8 feet deep, 1.5 miles off Key Largo, oceanside.																										
purple bush	4	5	4	1	8	7	5	3	2	2	3													44	4	29.7
silver	2		2	3	2	2	4	2	3	2	2													24	2.2	16.2
plume		2								1														3	0.3	2
yellow ribbon								2																2	0.2	1.3
candalabra					1				1															2	0.2	1.3
brown tree	2	3	1	3	1	1	2		1	2	1													17	1.5	11.4
others	9	8	7	4	3	4	2	4	4	4	7													56	5.1	37.8
TOTALS	17	18	14	11	15	14	13	11	11	11	13	0	0	0	0	0	0	0	0	0	0	0	0	148		

Another peak area for Purple Bush gorgonian

Hawk Channel, another patch reef about 1 mile away from the first.

purple bush	6	8		4	5		5	5	1	3	3	2	2	9	1	4	2	2	5		2			69	3.3	15.8
silver	2	2	2	9	2	3	5	1	2	2	6	5	5	6	2	4	5	5	5		4			77	3.7	17.7
plume						1				1														2	0.1	0.4
yellow ribbon				3							3		2											8	0.4	1.8
candalabra																								0	0	
brown tree			3	1	4			2	1			2	3	2		3	2	2	2	4	1			32	1.5	7.3
others	7	5	7	17	14	12	7	18	12	15	17	9	10	9	15	10	12	9	17	14	12			248	11.8	56.9
TOTALS	15	15	12	34	25	16	17	26	16	21	29	18	22	26	18	21	21	18	29	18	19	0	0	436		

A peak area for Yellow Ribbon gorgonian (Pterogorgia citrina)

Hawk Channel, about 2 miles offshore, patchy seagrass and barely-emergent flat rock substrate

purple bush				1											1	1								3	0.1	0.8
silver										1		6		2	5	4			1				1	20	0.9	5.6
plume																								0	0	
yellow ribbon	3	5	3	5	7	4	2	5	3	2	8		8	2	1	1	8	4	6	9	5	4	6	101	4.4	28.1
candalabra																								0	0	
brown tree		2	1	6	5	5	4	7	2	8	6	3	6	2	1	6	5	7	4	2	10	6	4	102	4.4	28.3
others	13	4	6	3	7	8	5	7	2	7	5	12	8	5	6	2	10	8	3	5	5	1	2	134	5.8	37.2
TOTALS	16	11	10	15	19	17	11	19	7	18	19	21	22	11	14	14	23	19	14	16	20	11	13	360		

A peak area for Purple Frilly gorgonian (Pseudopterogorgia elizabethae)

Outer slope of reef, depths 40-100 feet, hardbottom.

purple frilly	6	2	5	7	4	1	5	4	3	1	3		6	4	4	7	5	1	3	10	4	1	13	99	4.3	19.1
purple tree	1		1																				2	4	0.2	0.7
sea stalk	1		1			4				2	2			1	1		6			1		6		25	1.1	4.8
others	13	15	9	12	9	10	14	27	17	7	30	21	19	12	10	11	21	24	19	27	16	20	27	390	17	75.3
TOTALS	21	17	16	19	13	15	19	31	20	10	35	21	25	17	15	18	32	25	22	38	20	27	42	518		

December 17, 2009

156 Dove Ave.
Tavernier, FL 33070

Dr. Carolyn Belcher, Chair
SAFMC Scientific and Statistical Committee
GA Department of Natural Resources
Coastal Resources Division
One Conservation Way, Suite 300
Brunswick, GA 31520

Dear Dr. Belcher:

The purpose of writing this letter is to bring the best scientific information available on the gorgonian fishery under the South Atlantic Fishery Management Council's Coral Management Plan to your attention, and to that of your colleagues on the Committee. I have a feeling that few of your colleagues have done much snorkeling or diving in South Florida or the Keys, and thus do not understand that gorgonians are one of the most common groups of organisms growing on hardbottom areas of the Southeast U.S. coast, and on hardbottom and softbottom areas of the Gulf of Mexico.

I understand that this fishery is of minor significance versus the food fisheries, most of which are being overfished. However, this fishery, which is <u>not</u> overfished, is very important to the Marine Life Fishery, and is being managed quite nicely by the State of Florida. These regulations have been incorporated in toto in the Florida Keys National Marine Sanctuary. The gorgonian fishery is also very important to the fishermen, all of whom are Small Business Entities.

Gorgonians are managed as a group of species, just as are the stony corals. A particular species of gorgonian can inhabit one or more habitats, depending on its requirements. Each habitat has a variety of species of varying sizes. Harvest is very selective, based on size, esthetic appearance, and species, and thus is like plucking a blade of grass here and there from a lawn.

I have been diving and catching marine aquarium organisms in South Florida since 1956, when I came to the University of Miami, in Miami, Florida. Catching these organisms helped me pay for my education. My BS in zoology (1960), MS in marine biology (1963), and PhD in ichthyology (1968) all were attained here. Since then (except for a few years), I have lived in South Florida and worked full time catching organisms (including gorgonians) for marine aquariums. Since the 1980's, I have been an advisory panel member for the Coral Fishery Management Plan for both the Gulf and South Atlantic Councils. I am also president of the Florida Marine Life Association, a trade group of Marine Life Fishermen who are helping the State and Federal governments manage the fishery wisely.

During 2009, we helped the Florida's Fish and Wildlife Conservation Commission during its periodic evaluation of the Marine Life Fishery by providing it with observational data on populations of organisms, status of the habitats, and recommendations for harvest regulations.

GORGONIAN HARVEST LEVELS

Initial regulations on gorgonian harvest came about in 1982 when the Coral Fishery Management Plan was being developed, and a decision was made to include gorgonians in the plan. In 1990, the gorgonian harvest in the EEZ was capped at 50,000 colonies per year (Amendment 1). This value was agreed to by both the South Atlantic and Gulf Councils, and by the Marine Life Fishermen and the environmental group present. The State of Florida, understanding that there was no problem with harvest or ecology, then mandated that the harvest be unlimited in State waters as long as the EEZ harvest was not exceeded during the harvest year.

During 2009, the SAFMC coral advisory panel met and discussed the gorgonian fishery because of the latest revision of the Magnuson-Stevens Act. This Act required the Councils to establish a series of numerical harvest values for each fishery managed by the Councils, whether or not the fishery was overfished. Unfortunately, many of the members of the Coral Advisory Panel were unfamiliar with the fishery, had not seen the gorgonian habitats, and thus did not realize how abundant the gorgonians were. As a result, different members nominated values that spread throughout the spectrum. No consensus was reached. Since I did not realize this situation ahead of time, I did not bring to the meeting the scientific data that could have helped the Panel members.

Landings data for gorgonians is shown below, abstracted from the SAFMC Options Paper of October 2009 (Comprehensive Ecosystem-Based Amendment 2). The data is separated between EEZ waters and State waters because of the differing regulations. As you can see, the actual harvest in the EEZ (blue bars) is far below the allowable harvest, because demand has remained low but steady by the aquarium community. (I had testified in 1990 that a 50,000 colony quota in the EEZ was sufficient for the fishery.)

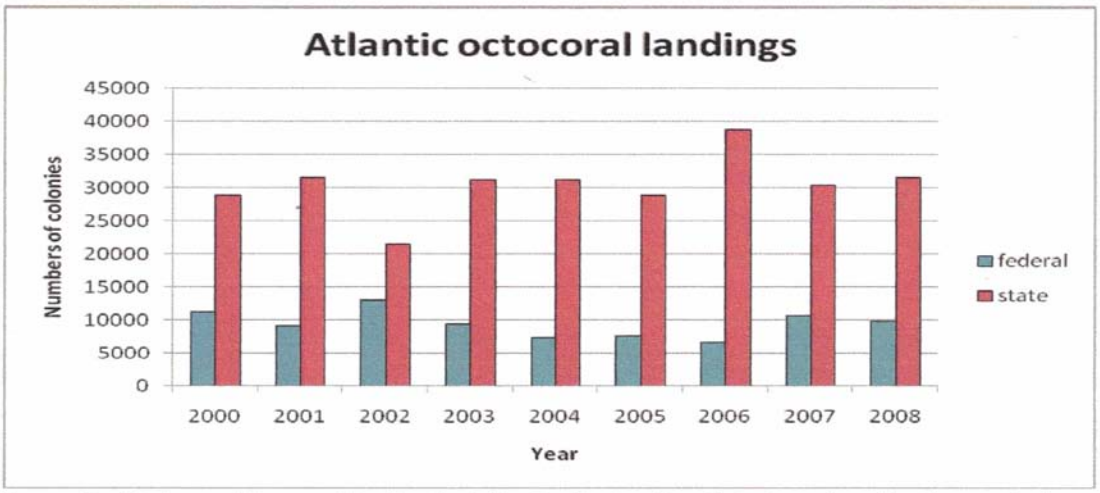

Figure 1. Octocoral harvest in South Atlantic Federal and state waters for the period 2000-2008 (Source: Florida Fish and Wildlife Research Institute).

Table 1. Octocoral harvest (in numbers of colonies) and ex-vessel value for South Atlantic federal and state waters for the period 2000-2008 (Source: Florida Fish and Wildlife Research Institute).

Year	State/Fed Waters	Numbers of colonies	Ex-vessel Value ($)
2000	Federal	11,253	25,509
2001	Federal	9,160	18,235
2002	Federal	13,114	33,116
2003	Federal	9,380	25,910
2004	Federal	7,352	21,370
2005	Federal	7,700	25,899
2006	Federal	6,670	20,594
2007	Federal	10,763	36,804
2008	Federal	9,831	35,747
TOTAL		**85,223**	**225,048**
2000	State	28,895	77,141
2001	State	31,500	87,799
2002	State	21,472	53,682
2003	State	31,187	83,463
2004	State	31,185	87,197
2005	State	28,901	87,557
2006	State	38,805	116,684
2007	State	30,393	102,041
2008	State	31,531	118,099
TOTAL		**273,869**	**813,663**

In the Gulf of Mexico, total octocoral harvest ranged from no harvest in federal waters during 2000-2005 to 5,234 colonies in state waters in 2001 (**Figure 2**). As in the South Atlantic, harvest of octocorals in the Gulf of Mexico occurs mainly in state waters. Total harvest in the EEZ off west Florida for 2000-2008 was only 460 colonies; whereas, total harvest for state waters over the same period was 35,076 colonies (**Table 2**).

(This paragraph mainly refers to the graph and table on the next page.)

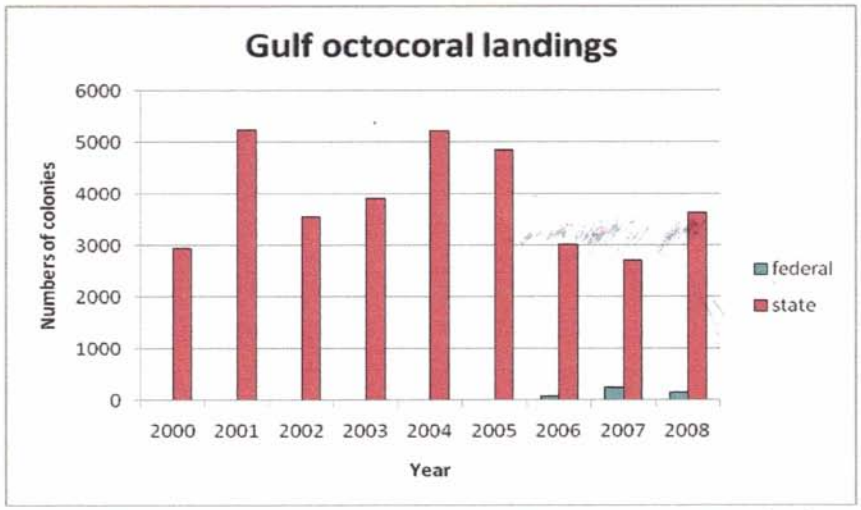

Figure 2. Octocoral harvest in Gulf of Mexico Federal and state waters for the period 2000-2008 (Source: Florida Fish and Wildlife Research Institute).

Table 2. Octocoral harvest (in numbers of colonies) and ex-vessel value for Gulf of Mexico Federal and state waters for the period 2000-2008 (Source: Florida Fish and Wildlife Research Institute).

Year	State/Fed	Numbers of colonies	Ex-vessel value ($)
2000	Federal	0	0
2001	Federal	0	0
2002	Federal	0	0
2003	Federal	0	0
2004	Federal	0	0
2005	Federal	0	0
2006	Federal	75	150
2007	Federal	234	523
2008	Federal	151	375
TOTAL		**460**	**1,048**
2000	State	2952	5,264
2001	State	5234	13,271
2002	State	3552	8,933
2003	State	3917	7,765
2004	State	5221	11,411
2005	State	4851	6,060
2006	State	3017	6,110
2007	State	2708	5,745
2008	State	3624	9,829
TOTAL		**35,076**	**74,387**

The list that I provided to Florida and to SAFMC of my gorgonian harvest in 2008 (and incorporated into the page by Myra and reproduced below) shows the top 10 species of gorgonians that I sold during 2008, including numbers of colonies, habitats, and jurisdictional waters. As you can see, the great majority of gorgonians are harvested in State waters. It would make sense in terms of scientific, financial, and effort for the SAFMC to remove gorgonians from the Coral Plan and allow Florida to manage the fishery.

Additional Information

Available habitat: (from 2000 FWRI reef Atlas: Benthic habitats of the Florida Keys, FMRI Tech report TR4 51 pages. FKNMS + Dry Tortugas National Park - provided by Dr. Walt Jaap):

Patch Reef: 3,370 hectares; 8,330 Acres
Outer Reef: 29,550 hectares; 73,010 Acres
Seagrass: 292,520 hectares; 722,840 Acres
Hard bottom: 82,370 hectares; 203,540 Acres
Bare Substrate: 14,820 hectares; 36,630 Acres
Unknown/uninterpreted: 74,170 hectares; 183,270 Acres

Octocoral density: means range from ~7 col/m^2 to ~25 col/m^2. However, these densities include *G. ventalina* which is a prohibited species and is a common gorgonian in the Keys and SE FL. (Vanessa Brinkhuis, FWRI).

Species harvested: (provided by Dr. Henry Feddern. Data for 2008)

Rank	# Sold	Species	Waters	Habitat	Bottom Type	Depth (ft)	Dist. from Shore
1	2409	*Diodogorgia nodulifera*	State	SE Florida	bedrock ridge	70-100	1 Mile
2	1855	*Muriceopsis flavida*	State	Upper Keys	bedrock & patch reef	10-15	1-2 Miles
3	1816	*Swiftia exserta*	State	SE Florida	bedrock ridge	60-90	1 Mile
4	1568	*Pseudopterogorgia elizabethii*	Federal	Upper Keys	forereef	50-80	3.5 Miles
5	1175	*Muricea sp.*	State	Upper Keys	smooth bedrock	10-15	0.5-1 Mile
6	1003	*Pseudopterogorgia sp.*	State	Upper Keys	smooth bedrock	3-15	Shore to 1 Mile
7	964	*Pseudopterogorgia sp.*	State	Upper Keys	patch reef	10-15	1-2 Miles
8	823	*Plexaurella sp.*	State	Upper Keys	smooth bedrock	10-15	0.5-1 Mile
9	739	*Pterogorgia anceps*	State	Upper Keys	smooth bedrock	3-10	Shore to 0.5 Mile
10	659	*Pterogorgia citrina*	State	Upper Keys	smooth bedrock	10-20	1-2 Miles

Top 3 species are not some of the more common species recorded in the field because they are deeper species. These deeper species are more colorful (reds and orange) than some shallow water species(Vanessa Brinkhuis, FWRI).

(NOTE: The species ranked 2 on the table above is a shallow-water species.)

Gorgonians grow on hardbottom areas such as exposed bedrock, coral reefs, and dead stony corals, from shore to at least 150 feet deep, and throughout the Caribbean, Gulf of Mexico, and on the East Coast of the US as far north as probably North Carolina. One species (Renilla) also occurs on soft bottom in the Gulf of Mexico, where it anchors itself in the mud.

Within the South Atlantic Council area of jurisdiction, there have been a number of population sampling counts:

4.12 Epibenthic Hardbottom Communities

Hardbottom habitat was identified by Davis (1982) as major bottom type. He reported 39.65 km^2 of octocoral-covered hardbottom within Dry Tortugas National Park (4.08 percent of the seafloor in the park). Throughout the Keys on both coasts, this is a very abundant and conspicuous habitat type. It is characterized by a great number of sponges and octocorals (sea whips, sea plumes, sea fans), and the topography is rather flat. Octocoral species density at a monitoring station at Pulaski Shoal was 15.50±3.50 species and 92.60±31.74 colonies per m^2. The area resembles a jungle with the sea floor totally obscured by the octocoral canopy. Octocoral hard grounds have a rich diversity in other species that use the canopy for refuge, to seek prey, and to breed.

The above is abstracted from the book "USA Coral Reefs", chapter 4: "A Perspective on Florida Keys Coral Reefs", by Walter Jaap, Alina Szmant, Karilyn Jaap, Jennifer Dupont, Robert Clarke, Paul Somerfield, Jerald Ault, James bohnsack, Steven G. Kellison, and G. Todd Kellison. (See Dr. Jaap's letter below, on page 9.)

The next abstract was authored by Jennifer Wheaton, and reports concentrations of 15 and 46 gorgonian colonies per square meter off the east coast of Florida.

RESULTS

The Breakers reef was representative of the outermost of three coral-inhabited terraces offshore of Palm Beach County. From a crest at 14 m depth, finger-like mounds extended seaward from the main reef body; the slope gradually decreased and ended at a flat rubble/sand plain in about 25 m depth. Octocorals, the most conspicuous sessile macroinvertebrates, overshadowed encrusting or plate-like stony corals. Large flabellate *Iciligorgia schrammi* colonies were common. Eleven octocoral species were recorded at a 20 m site and forty-six colonies were collected within 1 m^2. *Plexaura flexuosa* was most abundant, but greatest biomass was contributed by *I. schrammi*. Six other species were added but only 15 colonies were cleared from a 1 m^2 sample at 24 m depth (Table 1).

46 /m^2

Three sites off Key Largo basically represented deep slope and fore reef zones of bank barrier reefs of the Florida reef tract. Star corals (*Montastraea*), lettuce corals (*Agaricia*), clustered *Madracis*, and numerous sponges and octocorals colonized moderate relief mounds in 26-33 m depths at Carysfort. *Iciligorgia schrammi* and species of *Pseudopterogorgia* appeared most abundant and were among 13 octocoral species collected at 27.4 m (Table 1).

Discontinuous coral mounds on a flat rubble plain were observed at 33.5 m depth off French reef. Octocorals which appeared to be common between 33-35 m depths included *Iciligorgia schrammi*, species of *Pseudopterogorgia*, *Briareum asbestinum*, and *Plexaura flexuosa*. *Pseudopterogorgia*

Wheaton, Carib Jour Sci 23(2)

Wheaton, Jennifer, Carib. Jour. Sci., 23(2)

The following abstract also gives an estimate of gorgonian density per square meter (25.1).

Reprinted from BULLETIN OF MARINE SCIENCE
Vol. 23, No. 3, September, 1973
pp. 465–488
Made in United States of America

THE ECOLOGY OF THE CORAL-OCTOCORAL COMMUNITIES OFF THE SOUTHEAST FLORIDA COAST: GEOMORPHOLOGY, SPECIES COMPOSITION, AND ZONATION[1]

WALTER M. GOLDBERG[2]
University of Miami, Rosenstiel School of Marine and Atmospheric Science

ABSTRACT

Three parallel submarine terraces found along the southeast coast of Florida, stretching from Miami through Palm Beach County, are described. The central portion of this area near southern Palm Beach County was analyzed with respect to geomorphology, community composition, and zonation from the low-tide mark to a depth of 50 m. Twenty-seven species of scleractinian corals and 39 species of gorgonians are found here and define a typical coral-reef community farther north than has been acknowledged. Gorgonian diversity is maximal at a depth of 15-20 m, while scleractinians are most diverse in shallower water. Studies of gorgonian biomass indicate a trend toward large numbers of small individuals in low-diversity environments, and a smaller number of larger individuals in higher-diversity environments. A mean density of 25.1 colonies/m^2 gives these reefs the highest concentration of gorgonians yet recorded in the Caribbean region.

Also, there have been several estimates of the extent of hardbottom, coral patch, and coral reef areas. The reason that I include these three types of areas is that gorgonians are abundant in all of them. See the letter on the next page.

Henry Feddern

From: Walt Jaap [wjaap@tampabay.rr.com]
Sent: Monday, September 28, 2009 9:59 AM
To: 'Henry Feddern'
Subject: RE: habitat maps
Attachments: Jaap_Final.pdf

Hello Henry:

Good to hear from you. I am pleased to give you a hand and try to assist in figuring a number for the habitat and extrapolating or estimating number of individual colonies based on density measurements from sampling sites in the Keys. As a preface, let me acknowledge that since the 1984 review article was published there are additional publications that may aid you in your task. I am attaching a PDF from the book USA coral reefs, the chapter on the Keys may provide you with additional octocoral density data. As an example, at Pulaski Shoal, we counted 15.50 (plus or minus 3.5) species per sq m and 92.60 (plus or minus 31.74) colonies of octocorals per sq m. This is a high value as Pulaski is an octocoral jungle. Plus or minus is one standard deviation from the mean or average

In the context of better or more comprehensive habitat maps- FKMS has expended lots of $$ and effort on habitat maps. You might contact the sanctuary or FWRI GIS program (Henry Norris) to see what their most recent estimates for hard bottom are. USGS also has some comprehensive maps of the Keys. Barbara Lidz may be a good contact to get copies of their maps.

I have a copy of a 2000 FWRI reef Atlas: Benthic habitats of the Florida Keys, FMRI Tech report TR4 51 pages. They summarize the habitat, FKNMS + Dry Tortugas National Park):

Patch Reef: 3,370 hectares, 8,330 Acres
Outer Reef: 29,550 hectares, 73,010 Acres
Seagrass: 292,520 hectares, 722,840 Acres
Hard bottom: 82,370 hectares, 203,540 Acres
Bare Substrate: 14,820 hectares, 36,630 Acres
Unknown/uninterpreted: 74,170 hectares, 183,270

At the time the above were mapped, the unknown was mostly the area between Key West and Dry Tortugas.

You may be able to get the 1984 Ecology of the South Florida Coral Reefs as an HTML file at:

USGS National Wetlands Research Center: Publications - **Community ...**
Aug 12, 2008 **... Jaap, W.C. 1984. The ecology of the south Florida coral reefs: a community profile**. U.S. Fish and Wildlife Service Biological Services **...**
www.nwrc.usgs.gov/publications/commprof.htm - Cached - Similar

Hope this helps

Walter C. Jaap
Lithophyte Research- Team W

With the area values listed above, a rough estimate of total population of gorgonians **in the areas surveyed** can be made:

- 1 hectare = 10,000 square meters.
- Patch reef + outer reef + hardbottom areas = 115,290 hectares = 1,152,900,000 sq. m.
- The "additional information" above lists a mean range of 7 to 25 gorgonian colonies present in one square meter of the above areas.
- This means that the total gorgonian population is somewhere between 8 billion and 28.8 billion colonies **in the FKNMS and Dry Tortugas National Park areas alone.**

Keep in mind that the surveyed areas comprise only a tiny portion of the areas inhabited by gorgonians, thus any estimate of total population is guaranteed to be a major underestimate. Thus, any scientific uncertainty in calculating the values can be satisfied by using the smaller population density measurements. After all, populations that stay in place can be more easily counted than those that move around.

There is also data on reproduction, growth rates, longevity, and natural mortality. This abstract reports vegetative reproduction in the species that the Panel recommends adding to the list of allowable gorgonians.

J. Exp. Mar. Biol. Ecol., 1983, Vol. 72, pp. 157–169
Elsevier

VEGETATIVE REPRODUCTION IN THE OCTOCORAL *BRIAREUM ASBESTINUM* (Pallas)

HOWARD R. LASKER
Department of Biological Sciences, State University of New York at Buffalo, Buffalo, New York 14260, U.S.A.

Abstract: *Briareum asbestinum* (Pallas), a common octocoral of Caribbean reefs, produces runner-like branches which are capable of attaching to the substratum and establishing new colonies. The subsequent death of the intervening runner leaves groups of genetically identical but physiologically distinct colonies. The origin of these colonies can be deduced by the presence or absence of runners. Analysis of colonies at Marsarkantupo in the San Blas Islands, Panama and at Carrie Bow Cay, Belize indicate that 23–56% and 18–67%, respectively, of the colonies at these sites originate from vegetative runners. In both areas the distribution of colonies of larval origin is not uniform. Colonies originating from larvae are patchily distributed within habitats and are over-represented in shallow habitats. The ability of *B. asbestinum* to reproduce vegetatively results in the spread and development of large populations of this species in many habitats where it might otherwise be rare.

The following abstract describes growth rates of 10 to 40 mm annually of one species, says that colonies only 25-35 mm in height were sexually mature, and reports on several density counts.

(solid) substrate. Juvenile (sexually immature) characteristics are not significantly different from the adult's. Greatest mortality occurs during larval and juvenile stages. Growth proceeds by asexual budding of polyps and is determinant. Octocoral growth rates have not been intensely studied. Kinzie (1974) reported that the black sea rod *(Plexaura homomalla)* exhibited colony growth of 10-40 mm annually. The study also noted that sexually mature colonies were 25-35 mm in height. Kinzie's study was in the Cayman Islands but would generally apply to Florida populations.

Octocorals suffer high mortality from storms when wave surge is too great for the holdfast or the substrate itself becomes dislodged. The colony is often carried off the reef proper and recovery after dislodgement is frequently unsuccessful.

Density of octocorals ranges from very dense to sparse, dependent upon the habitat; variability is quite high. Work at Biscayne National Park, for example, documented a range of 10-50 colonies within a square meter. Both Wheaton (in preparation a) and Opresko (1973) conducted studies in patch reef habitats. Dominant species at Biscayne National Park were *Plexaura flexuosa, P. homomalla, Gorgonia ventalina, Eunicea succinea,* and *Pseudopterogorgia americana*. Opresko reported mean densities of 6.9, 11.3, and 27.1 colonies/m^2 at three reefs.

The octocoral fauna from about Stuart-Palm Beach to Dry Tortugas in depths to near 30 m is typical Caribbean or Tropical Atlantic in species composition. Local environmental conditions (depth, light, substrate, and current) control community structure.

(Jaap, Walter. 1984. The Ecology of the South Florida Coral Reefs. 139 pp. FWS/OBS-82-08)

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL FISHERY HARVEST VALUES

- MSY = Maximum Sustainable Yield
- OFL = Overfishing Level
- ABC = Acceptable Biological Catch
- ACL = Allowable Catch Limit
- AMs = Accountability Measures

CALCULATIONS

Put aside the current gorgonian quota values temporarily. Then calculate the Council's harvest values (MSY, OFL, ABC, ACL, and AMs) by using the above estimates of population in the formulas used for calculating these values for the other fisheries. If the calculated "allowable catch limit" is less than the current gorgonian quota value, then recommend the lesser value. If the calculated value is far greater than the current quota, then set the calculated value as the "allowable catch limit", since all fisheries are required to be managed by the best available science.

As for the concept that gorgonians are an "essential fishery habitat" and thus cannot be harvested, there is precedent in the harvest of oysters, which in the "Final Comprehensive Amendment Addressing Essential Fish Habitat in Fishery Management Plans of the South Atlantic Region" are named as the "keynote species" in the oyster habitat, yet are harvested in wholesale quantities. According to my experience, gorgonians of the sizes that are harvested in this fishery are seldom used as shelter for fishes. I sent Myra a set of underwater photos that show that fish prefer to shelter around stony corals rather than gorgonians. According to the literature, gorgonians serve as food for very few organisms, none of which are managed by the SAFMC.

The reason that there has been no problem with overharvest of gorgonians is that this portion of the Marine Life Fishery (as well as the entire fishery) is demand driven. In other words, in contrast to the food fish fishery where every fish that is caught can be sold, a gorgonian can be sold only if it has been ordered by a buyer. If I can't sell a gorgonian, I am not going to catch it.

ENCRUSTING GORGONIANS

I agree with the Coral Panel that there is no reason to exclude the encrusting gorgonians from harvest. These are very abundant. The prohibition of harvest came about during the discussions on Live Rock because gorgonians are harvested with a small amount of substrate attached to the base, so that the colony is not injured and so that it has a base that will allow it to stand up. (Any portion of the colony that touches a hard surface for a day or so will die). Since encrusting gorgonians were harvested with the rock underneath, they were not allowed because this could have been used as a loophole to harvest live rock. I did not elaborate on the fact that with Briareum, only one form encrusts rock. Another form encrusts dead skeletons of other gorgonians, and another (nonencrusting) form grows a small base and sends up vertical stalks. The form that encrusts rock can be peeled off the rock. The panel recommends that all forms of encrusting gorgonians be allowed, but that the forms encrusting rock be peeled from the rock.

AQUACULTURE OF GORGONIANS

I have read the papers by Ellis and Sharron ("The Culture of Soft Corals (Order:Alcyonacea) for the Marine Aquarium Trade", CTSA Publ. #137 and "Recent Advances in Lagoon-based Farming Practices for Eight Species of Commercially Valuable Hard and Soft Corals –A Technical Report", CTSA Publ. #147) dealing with the aquaculture of gorgonians in Micronesia. These papers are very well written, but cannot be easily applied to Florida. The main points in the papers are:

- The gorgonians cultured in these papers are all encrusting or have very thick stalks except for one species, and can be laid on the substrate without harm.
- The culture method described is much simpler than for thin-stalked gorgonians.
- Raising the fragments requires an ocean area free from wave action with good water quality.
- The paper implies that a good size for the saleable cultured gorgonian would be about 2 inches tall (page 57).
- The land facilities described (in Micronesia) need to be located in low-cost or rural areas of approximately 300 meters in length along the coast, with good quality sea water.

Unfortunately, no areas like this exist in Florida, due to zoning, cost, and/or water quality. Although it seems that a few species of gorgonians could be aquacultured on live rock sites, the sites are not in protected waters, and thus are subjected to wave action, red tide (in the Gulf of Mexico), hurricanes, theft, and vandalism. The reason why I go to so many habitats for the various species of gorgonians is that only a few species that I catch occur in any one habitat (among many other species that I do not catch). In order to culture them all, I would need to have aquaculture sites in each of the habitats that I mentioned above. As a result, the regulatory difficulties, labor, cost, and time needed to produce enough to make it economically worthwhile would be prohibitive. Not only that, but the sizes demanded by the market (6 to 20 inches) require that the gorgonians lay down in the shipping container. If the weight of the artificial base is heavy enough to hold the gorgonian upright in the culture area during wave action, it is heavy enough to damage the gorgonian during shipping, because air freight personnel are not gentle.

CONCLUSIONS

In summary, it seems clear that there is enough scientific information to determine the fishery values required by the Council. Based on the above information, I feel that there is no need to reduce the annual catch limit (quota in the EEZ) because there is no possibility of overharvest. In fact, to be fair, the harvest values in this fishery should be calculated in the same manner as all the other fisheries.

I recommend that the harvest of wild gorgonians be allowed to continue under the current regulations, which should satisfy everyone that the habitats are not going to be altered by this harvest. Keeping the current regulations will also allow gorgonian aquaculture at live rock sites. If aquacultured gorgonians become more desirable than wild ones, then the market will do the best job of regulating the fishery.

Include the encrusting gorgonians in the list of allowable species. These species are very common, and one species colonizes dead gorgonian skeletons, thus recycling the skeleton. These species can be harvested responsibly.

Since the vast majority of gorgonians are harvested from State waters and gorgonians are not in danger of being overharvested due to their abundance and the selective harvesting methods used, nor does the harvest change the habitat, the Council should exclude them from the Coral Management Plan, and direct their management to Florida. This would end the need to spend money and time on researching and/or gathering any additional scientific data needed, and then calculating the fishery management values mandated by Congress and required by NMF. This money and time could be better used in managing the food fisheries.

Yours truly,

Henry Feddern, PhD
Marine Biologist
Member Coral Advisory Panel
President Florida Marine Life Association